CLEANING ATTACHMENT FOR FLUID DISPENSER NOZZLES AND FLUID DISPENSERS USING SAME

FIELD OF THE INVENTION

The present invention generally relates to a nozzle attachment for removing residual material retained on the dispensing nozzle of a fluid dispenser by a gas flow at a discharge nozzle during intermittent fluid dispensing operations involving opening and shutting off of a fluid dispenser. The gas flow creates a shearing force at the discharge end of the nozzle that dislodges and blows off any residual material clinging to the discharge end after a prior dispensing operation or cycle.

BACKGROUND OF THE INVENTION

Positive flow cut off of a filling apparatus is difficult to achieve in sanitary valves, especially when viscous fluids are being dispensed which have a tendency to leave tailings that cling to the dispenser nozzle after a dispensing cycle. For example, when running hot process cheese at 160 to 180 degrees Fahrenheit, it is difficult to achieve positive flow cutoff in a filling apparatus using conventional sanitary filling valves. Upon full closure of a dispensing valve, residual cheese tends to adhere to external valve surfaces. This retention can lead to unacceptable variability in weight control for the packaged cheese. In addition, the residue can become dislodged at a later time, and possibly drip or otherwise drop onto an underlying conveyor belt or other surfaces where it can soil surfaces and make the processing environment less sanitary. Removal of the drip or tailing residues from the nozzle by mechanical or manual means is generally difficult or overly burdensome in practice because of the increased measures that need to be taken to avoid contamination and maintain sanitary conditions at the dispenser nozzle.

The prior art reflects a number of different approaches to preventing build-up of residue of dispensed material on dispenser nozzles. U.S. Pat. Nos. 5,309,958; 4,970,985; 4,350,187; 3,926,229, and Japanese published appln. nos. all generally describe a dispensing apparatus including means for removing tailings and the like

by which air or a gas is blown out of a hole or array of gas passageways provided in the dispensing head itself. However, these approaches require fundamental design changes in the dispenser head or filling valve construction. It would be highly desirable to solve the tailings problem in a manner which can be implemented on existing dispensing head equipment with little modification or retrofitting required on the dispenser head, especially with respect to the wetted parts of the dispenser head.

U.S. Pat. Nos. 5,226,565 and 5,447,254 describe nozzle attachments or fittings for dispensers for use in nozzle cleaning or shut-off drip protection. Both patents provide air passageways that direct air at the discharge end of a nozzle in which the air passageway is partly defined by dispenser head components and not the nozzle attachment exclusively. The attachment of the nozzle attachment and detachment requires the use of tools and the attachment uses wetted parts of the nozzle in the blow off operation.

A need still exists for fluid dispenser arrangements that will ensure that residual material is cleaned off of dispenser nozzles as part of each dispensing cycle so that the amount of food dispensed from one filling cycle to the next does not vary, and so that the sanitary condition of the dispenser can be better maintained. Further, there is a need for a solution to the nozzle clinging/dripping problem that does not require fundamental design changes in the dispensers.

SUMMARY OF THE INVENTION

This invention provides an improved nozzle attachment for removing residual material from the discharge ends of dispenser nozzles used for dispensing flowable materials. The invention also provides a dispenser incorporating the improved nozzle attachment and methods of their use in filling procedures. According to an embodiment, the nozzle attachment of this invention is an assembly of a relatively small number of discrete parts that can be readily assembled into a unified component for installation on a nozzle, and which also can be easily dismantled into its individual parts for inspection and cleaning-out-of-place or manual cleaning. Therefore, in one aspect, the nozzle attachment is conveniently used for sanitary dispensing applications, although not limited thereto. In one aspect, no tools are required to couple the nozzle attachment to a nozzle nor

are they needed to dismantle it for inspection and cleaning, as the device can be assembled and disassembled completely by hand.

In accordance with an embodiment, the nozzle attachment provides the gaseous hydrodynamic system used to create the "blow off" force and effect on nozzle residue, and the fluid dispenser head is not modified to support that function other than providing a suitable mounting surface thereon for the nozzle attachment. Therefore, the nozzle attachment can be easily used on many different types of fluid dispensing heads. It is preferred to provide a nozzle attachment that can be readily attached or detached from a nozzle to facilitate full inspection and/or cleaning without the need for tools to disconnect or to disassemble the nozzle attachment for cleaning. To this end, in one embodiment a quick connect and disconnect device that is operable manually without the need to use tools to attach and detach the nozzle attachment to the nozzle. In one aspect, the quick connect and disconnect device comprises a clamping retainer for clamping the attachment to an attaching portion of the dispensing nozzle without the use of a tool. Preferably, a split ring clamping retainer is used and threaded members including wing nuts are manually threaded to tighten or loosen the clamping force.

In an embodiment, the nozzle attachment includes a retainer by which it is releasably attachable to a dispensing nozzle, and a pair of hollow-bodied nozzle attachment components that define, when nested together, an intervening space that serves as a gas passageway in-between them into which pressurized gaseous fluid can be introduced. The introduced pressurized gas flows into the gas passageway and from there is directed to a discharge opening thereof provided at a lower axial end of the nested nozzle attachment components. The gas passageway present in the assembled nozzle attachment is adapted to emit a gas stream at an inward and downward angle relative to a discharge end of the dispensing nozzle effective to create a shearing force at the discharge end of the nozzle that dislodges and removes any residual material clinging to the discharge end after a prior dispensing operation or cycle. This ensures that residual material is cleaned off of the dispenser nozzles as part of each dispensing cycle so that the amount of food dispensed from one filling cycle to the next does not vary, and the sanitary condition of the dispenser is better maintained.

The nozzle attachment of this invention is generally applicable to dispenser nozzle arrangements used to dispense viscous fluid materials. These viscous fluid materials include edible materials and foods that can be processed in a flowable state, such as process cheese, dairy cream, mayonnaise, meats, peanut butter, and so forth. The nozzle attachment is especially well-suited for nozzled fluid dispensers used to dispense higher viscosity or tackier fluid food products having a greater tendency to cling to dispensing nozzles, although it also can be used to advantage with fluid dispensers used for other types of fluids having those attributes. These other types of viscous materials can include polymeric compositions, plastic compositions, hot melt adhesives, and so forth.

In one embodiment, the nozzle attachment includes an outer nozzle attachment component comprising a cylindrical portion having an inner surface with an inner diameter, and a flanged surface extending radially outward at one axial end thereof and an inward-facing beveled surface at the other axial end thereof, and further including an air inlet adapted to receive pressurized gas through the cylindrical portion. It also includes an inner nozzle attachment component including a cylindrical portion having an outer surface with an outer diameter that is smaller than the inner diameter of the outer nozzle attachment component. The inner attachment component has a collar extending radially outward at one axial end thereof, and an outward-facing beveled surface at the other axial end thereof. The inner nozzle attachment component is adapted to be nested within the outer nozzle attachment component by positioning of its collar on the flanged surface of the outer nozzle attachment component. When nested, an internal upper gas passageway is defined between the outer surface of the inner nozzle attachment component and the inner surface of the outer nozzle attachment component that is in communication with the gas inlet of the outer nozzle attachment component. The nozzle attachment includes a retainer adapted to releasably retain the outer nozzle attachment component on the nozzle while the inner nozzle attachment component is nested therein.

This nesting configuration of the two components also defines a lower gas passageway having a gas discharge opening that is defined between the outward-facing beveled surface of the inner nozzle attachment component and the inward-facing beveled surface of the outer nozzle attachment component. The lower gas

passageway is in fluid communication with the upper gas passageway. The lower gas passageway is adapted by its configuration to direct pressurized gas at an inward and downward angle at the discharge end of the nozzle. The gas emitted by the nozzle attachment at the discharge opening creates a shearing force at the discharge end of the nozzle that will dislodge and remove any residual material clinging to the discharge end after the most recent dispensing operation. This ensures all product dispensed per dispensing cycle gets packaged in that cycle, and that uniform amounts of food are dispensed in each dispensing cycle. Herein, the nested components are easily assembled or disassembled by moving the nested inner component axially relative to the outer component. This allows quick separation for cleaning and re-assembly after cleaning.

In another embodiment, there is a fluid dispenser for use in intermittent dispensing operations that incorporates the nozzle attachment described herein. The dispenser includes a dispenser body having a fluid inlet communicating with a fluid passageway, and the discharge nozzle having the discharge end from which fluid is dispensed. There is a valve stem positioned within the fluid passageway adapted to be controllably moved vertically up and down within the fluid passageway by an actuator. A valve head is located in the discharge end of the discharge nozzle. The nozzle attachment is used after each dispensing cycle to eliminate residue clinging from the discharge end of the nozzle.

In one preferred embodiment, the dispenser valve head has a truncated cone shape having increasing diameter axially nearer the discharge end of the nozzle and smaller diameter axially further from the discharge end of the nozzle. The truncated-cone shaped valve head has a first diameter adapted to seal with the discharge passageway of the nozzle to stop fluid flow out of the discharge end of the nozzle when the valve stem is sufficiently vertically upraised, and a second diameter, smaller than the first diameter, in which a gap is provided between the second diameter and inner walls of the discharge passageway of the nozzle when the valve stem is sufficiently vertically lowered, to permit flow of fluid out of the discharge end of the nozzle until the valve stem is raised again.

For purposes herein, the term "fluid" means materials in a wet flowable condition, including liquids, slurries, emulsions, pastes, creams, hot melts, and so forth. The term "gas" can mean dry gases, and vapors, such as steam. The term

"manual cleaning" means total disassembly for cleaning and inspection. "Clean-out-of-place" or "COP" means a part can be partially dissembled and cleaned, such as in specialized COP pressure tanks. "Clean-in-Place" or "CIP" means no disassembly or partial disassembly is required to clean a part. "Sanitize" or "sanitary" and the like refers to the reduction of microorganisms to levels considered safe from a public health standpoint. "Sterilize" or "sterile" and the like refers to the statistical destruction and removal of all living organisms.

BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages of the present invention will become apparent from the following detail description of preferred embodiments of the invention with reference to the drawings, in which:

FIG. 1 shows a cross-sectional view of a fluid dispenser having a nozzle attachment releasably connected to it according to an embodiment of the invention, in which the valve head is in a sealed/closed position.

FIG. 2 shows the fluid dispenser and nozzle attachment according of FIG. 1, in which the valve head is in an open position.

FIG. 3 is an enlarged perspective view of the nozzle of the dispenser of FIG. 1 without the nozzle attachment.

FIG. 4 is an enlarged cross-sectional view of the nozzle attachment coupled to the nozzle of the dispenser of FIG. 1, which is taken along section A-A indicated in FIG. 5.

FIG. 5 is a top view of a nozzle attachment according to an embodiment of the invention including a top partial view of a discharge end of a separate dispenser nozzle to which the nozzle attachment is attached, taken along section B-B indicated in FIG. 2.

FIG. 6 is an exploded view of a nozzle attachment according to an embodiment of the invention.

FIG. 7 is a cross-sectional view of an outer nozzle attachment component of the nozzle attachment according to an embodiment of the invention.

FIG. 8 is a cross-sectional view of an inner nozzle attachment component of the nozzle attachment according to an embodiment of the invention.

The features depicted in the figures are not necessarily drawn to scale.

Similarly numbered elements in different figures represent similar components unless indicated otherwise. Elements and dimensions in the figures are not necessarily drawn to scale.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a fluid dispenser **100** having a nozzle attachment **10** according to an embodiment of the invention is illustrated. A general overview of the manner in which the dispenser **100** functions is provided as follows. Axial movement of the valve head **11** up or down in the vertical direction to operate the dispenser **100** occurs in the following manner. For purposes of the descriptions herein, references to an axial direction means parallel to the direction of the centerline **12** of the dispenser **100**, while a radial direction will be perpendicular thereto.

The valve head **11** is normally maintained in a closed position in which it is seated against the inner walls **13** of the discharge end **14** of the nozzle **15** in a sealing relationship. The dimensions of the valve head **11** and inner walls **13** at the discharge end **14** of the nozzle **15** are machined to have very close tolerances so that an essentially gap-free seal is made between the valve head **11** and the inner walls **13** of the valve head **11**, so that leakage is minimized during nondispensing times of operation.

In this non-limiting illustration, a biasing means, such as a return spring **16** located in an actuator **17**, is used to keep the valve head **11** normally in the closed position. The valve head **11** is connected to the actuator **17** via a valve stem **18**. The valve stem **18** can be vertically reciprocated by the actuator **17**, as indicated by the double-arrow in FIG. 1. The valve stem **18** can be releasably attached, e.g., by threading or other mechanical connection means **19**, to the actuator **17**, so that the valve stem **18** can be detached for inspection and cleaning without need to disassemble the actuator **17**.

In order to move the valve head **11** to an open position and permit flow of fluid out of the dispenser **100**, pressurized air is introduced into a cavity **21** in the actuator **17** via a port **21** by way of an air line **32** connected to a supply source of pressurized air **27** ("S_1"). The flow or pressurized air through line **32** is preferably controlled via valve **26** ("V_1"), which is operated by a controller **28**, such as a

microprocessor-based controller, via a communication line **34**. The controller **28** can be interfaced and programmed via communication line **31**. Radio frequency signal control techniques and the like also could be used.

Referring to FIG. 2, the pressurized air fed through line **32** is provided in sufficient force to overcome the biasing force of the spring **16** and causes the actuator **17** to move the valve stem **18** vertically downward. This downward movement of the valve stem **18** unseats the valve head **11** as the larger diameter portion of the valve head **11** clears the bottom of the discharge end **14** of the nozzle **15** and a smaller diameter portion of the valve head **11** has clearance between it and the inner walls **13** of the nozzle **15** through which fluid fed through inlet **24** and passing down through passageway **25** defined inside the valve body **20** can then exit the dispenser **100** through nozzle **15**.

In one preferred embodiment, the valve head **11** has a truncated cone-shaped body. The valve head **11** tapers inward in the upward axial direction. The valve head makes a tight seal with inner walls **13** of the nozzle **15**. As illustrated in FIG. 2, when the valve stem **18** is moved downward, it pushes the valve head **11** at least partially out of the discharge end **14** of the discharge passageway **22**. Because of the tapering external profile of the valve head **11**, a circumferential gap **37** will be created between the exterior surface of the valve head **38** and the inner walls **13** of the discharge passageway **22**. The fluid can then flow through the gap created and out of the discharge passageway **22** at the discharge end **14** of nozzle **15**.

After a desired amount of fluid is discharged from the dispenser **100**, the valve head **11** is returned to its closed, seated position within the nozzle **15**. In this illustration, the valve **26** is closed by the controller **28** and pressurized air in line **32** can be bled off at valve **26**. Upon doing this, biasing action of the return spring **16** pulls the valve stem **18** vertically upward until the valve head **11** seats again in sealing relationship inside the discharge end **14** of the nozzle **15**.

In this non-limiting illustration, the fluid dispenser involves a single seat, shut-off valve system with positive control. It will be appreciated that the actuator **17** alternatively could be a manual actuator as used to control up and down vertical movement of the valve head **11**. The actuator **17** itself basically can incorporate features and functions used in such mechanisms in conventional filling valves. The

open yoke feature **23** shown in Fig. 1 is generally known in filling valves and is typically used to reveal the valve stem position and prevent product from entering the actuator **17**. These types of pneumatic filling valves also typically include bearings and sealing O-rings, and so forth, used to support their actuation functionality that are generally conventional in nature, which do not by themselves form part of this invention, so they are not discussed in detail here to simplify the discussion. Persons of skill will appreciate how to employ those types of filing valve features in the context of the present disclosure.

While the valve head **11** is in the closed position and before initiating the next dispensing cycle, a nozzle attachment **10** according to an embodiment of the invention is employed to eliminate any residue of dispensed fluid left clinging to the discharge end **14** of nozzle **15**. The nozzle attachment **10** is releasably attached to the nozzle **15**, preferably prior to initiating the dispensing operation.

As shown in FIG. 3, in this non-limiting illustration, the nozzle **15** is fabricated to include an integral skirt **40**, i.e., a narrow protuberance that circumscribes an outer surface area of the nozzle **15**, to which the nozzle attachment **10** can be releasably mechanically connected. The skirt **40** is located near and axially above the discharge end **14** of the nozzle **15**. The discharge end **14** has an outer surface circumferential surface **161**.

As shown in FIG. 4, the nozzle attachment **10** is a nozzle fitting that can be releasably coupled to the nozzle **15** via the skirt **40**. In general, the nozzle attachment **10** includes an assembly of separate discrete parts or components that are assembled together to form an annular-shaped fitting, which is fitted circumferentially around and mechanically coupled in place to the nozzle **15** with a retainer **70**. The nozzle attachment **10** includes an inner nozzle attachment component **41** that nests inside an outer nozzle attachment component **42** in a coaxially aligned manner defining gas passageways **43** and **44** between the outer surface **45** of the inner nozzle attachment component **41** and the inner surface **46** of the outer nozzle attachment component **42**. The inner nozzle attachment **41** has an inner surface **409** having an inner radial diameter **410** that is large enough to slip over and concentrically surround the nozzle **15** at its discharge end **14** in a spaced relationship with respect to the outer surface **161** of the discharge end **14** of nozzle **15** where located below the skirt **40**.

Pressurized gas fed into the gas passageway **440** comprised of fluidly communicating gas passageways **43** and **44** in the nozzle attachment **10** are emitted from a discharge opening **47** at the lower axial end **48** of the nozzle attachment **10**. This emitted gas **49** has a trajectory making an angle β (beta) with the horizontal plane **141** of the discharge end **14** of the nozzle **15**. The horizontal plane **141** of the discharge end **14** extends generally perpendicular to axial direction **12**. The force associated with the stream of pressurized gas **49** exiting the nozzle attachment **10** is effectively used to blow food residues off the discharge end **14** of the nozzle **15** by action of shearing forces.

The retainer **70** includes an internal circumferential groove **71** that is dimensioned to conformably receive the nozzle skirt **40** under an upper protrusion **74** of the retainer **70**, while concurrently receiving a flanged portion **53** of the outer nozzle attachment component **42** in a conforming manner above a lower protrusion **75** of the retainer **70**. The outer nozzle attachment component **42** includes a circumferential groove **73** immediately below its flanged portion **72**, which conformably receives the lower protrusion **75** of the retainer **70**.

In this non-limiting illustration, ferrules **764** and **766** are clamped using a tightening mechanism **760** using a sealing gasket **765**. As illustrated in more detail in FIG. 6, for example, the ferrules **764** and **766** can be clamped in a bore **768** provided through a connecting body **767** integrally associated with another wing nut tightening mechanism **760** using sealing gasket **765**.

Referring to FIG. 4 again, this provides a reliable system for feeding pressurized gas **301** into an inlet port **300** extending through the tightening mechanism **760** that feeds into the upper passageway **43** of the nozzle attachment **10**. From there, the pressurized gas flows into lower passageway **44** of the nozzle attachment **10**. The nozzle attachment **10** can be readily assembled and dismantled for cleaning and inspection. One of the ferrules **764** has one of its axial ends held, such as by welding, press-fitting, molding and so forth, in a recess provided in the outer nozzle attachment component **42** in an essentially air-tight manner, while the other opposite end is releasably mounted in a recess in the wing nut tightening mechanism **760**.

Referring to FIG. 5, the retainer **70** is preferably a quick connect and disconnect device, e.g., a hinged tri-clamp construction operable without the use of

a tool and herein includes threaded fasteners comprising a wing nut tightening mechanism **76**. The wing nut mechanism **76** basically is a winged threaded bolt **761** that is screwed through a threaded nut **762** and a threaded bore in a hinge arm **763**, which permits the retainer clamp **70** to be easily tightened and loosened by hand. The retainer can also include a turn lock in place retainer feature (not shown), e.g., about a 30 degree turn lock in place retainer feature. Other quick connection and disconnect retention mechanisms also could be used that provide similar or comparable functionality or result.

Referring again to Fig. 6, the exploded view shows in more clarity a retainer gasket **77** used in combination with retainer **70** as indicated in FIG. 4. The retainer gasket **77** has an inside diameter that is larger than the outer diameter of the inner nozzle attachment component **41**. The outer diameter **63** of the inner nozzle attachment component **41** is indicated in FIG. 8. As can be seen in FIG. 7, the outer diameter **63** of inner nozzle attachment component **41** is similar in dimension to an upper flange surface **421** on the outer nozzle attachment component **42**, upon which the inner nozzle attachment **41** is sealingly positionable for installation on the nozzle **15**.

As shown in FIG. 7, the outer nozzle attachment component **42** includes a cylindrical body portion **50** having an inner surface **46** with an inner diameter **52**. It also has the flanged surface **53** at one axial end **54** thereof and an inward-facing beveled surface **55** at the other axial end **56** thereof. It also includes a gas inlet **57** adapted to receive pressurized gas through the cylindrical portion **50**.

As shown in FIG. 8, the inner nozzle attachment component **41** includes a cylindrical body portion **61** having an outer surface **45** with an outer radial diameter **63** that is smaller than the inner radial diameter **52** of the outer nozzle attachment component **42**. Inner nozzle attachment component **41** also has a collar **64** extending radially outward from the cylindrical portion **61** at one axial end **65** thereof, and an outward-facing beveled surface **66** at the other axial end **67** thereof.

For the purpose of quick connect assembly and disassembly without the use of tools, the inner nozzle attachment component **41** is adapted to be concentrically nested within the outer nozzle attachment component **42** by positioning of its collar **64** on the flanged surface **53** of the outer nozzle attachment component **42**. The inner nozzle attachment component **41** has an inner radial surface **409** which is

sized to slip over and concentrically surround the outer surface **161** of the discharge end **14** of nozzle **15**. The gap size provided between the outer nozzle surface **161** is not particularly limited as long as the gas emitted from discharge opening **47** can be maintained at sufficient force to shear tailings off the end of the dispenser nozzle. For example, the gap (not shown) can be about 0.1 to about 0.2 inch, or some other positive value.

When the inner and outer nozzle components **41** and **42** are nested, not only is an internal upper gas passageway **43** is defined between the axially extending side surfaces of the components that encompasses the full circumference of the attachment **10**, but also an inwardly and downwardly angled lower gas passageway **44** is defined between the inner and outer nozzle attachment components **41** and **42**. The lower gas passageway **44** is in fluid communication with the upper gas passageway **43**, which together form a continuous single gas passageway **440** between the gas inlet **57** and the discharge opening **47**.

As seen in FIG. 4, the beveled surface **55** of the outer nozzle attachment component **42** and beveled surface **66** the inner nozzle attachment component **41** define an angled intervening gas passageway **44** when the nozzle components are nested together. As indicated in FIG. 7, the lower beveled surface of **55** the outer nozzle attachment component **42** preferably makes an angle α (alpha) with the axial direction **12** of the dispenser system which is greater than 90 degrees and less than 180 degrees, and preferably is about 125 to about 160 degrees, and more preferably is about 135 to about 150 degrees (absolute value). As indicated in FIG. 8, the lower beveled surface of **66** the inner nozzle attachment component **41** preferably makes an angle θ (theta) with the axial direction **12** of the dispenser system which is greater than 90 degrees and less than 180 degrees, and preferably is about 125 to about 160 degrees, and more preferably is about 135 to about 150 degrees (absolute value). The nozzle attachment components **41** and **42** can be designed to provide absolute angle values for angles α and θ that are approximately the same such that passageway **44** has generally parallel facing walls. The angles α and θ also can be different at least to the extent the inner facing walls defining passageway **44** in the nozzle attachment **10** do not physically converge. For example, nozzle attachment components **41** and **42** can be designed to provide absolute angle values for angles α and θ that create a nozzle-shaped

passageway such that the facing walls of passageway **44** taper down towards each other in the direction of the discharge opening **47**. Either way, this is desired so that the gas stream **49** exiting the nozzle attachment **10** has an angle of attack on the nozzle discharge end **14** that is directed both radially inward and axially downward. In this way, shearing force action will be applied by the emitted gas stream **49** to any residual material clinging to the discharge end **14** after the most recent dispensing operation. Therefore, uniform amounts of fluid product can be packaged in each container.

Also, the emitted gas stream **49** also will incorporate a downward force to help clean/remove any residual material that may curl or wrap around the outside diameter of the valve. These "blow off" forces can be applied to residual material clinging, dripping, drooling, curling, sticking, or otherwise remaining as a tailing on the discharge end **14** of the nozzle **15** after a prior dispensing procedure ensures all product dispensed per dispensing cycle gets packaged in that cycle, and that uniform amounts of food are dispensed in each dispensing cycle.

In one embodiment, an external supply **30** (" S_2") of sanitary or sterile gas under pressure is used to feed pressurized gas **301** into the nozzle attachment **10**. A valve **29** ("V_2") can be controlled automatically via controller **28**. For example, a microprocessor-based controller **28** can be used to synchronize the timing of the movement of the valve head **11** in the dispenser **100** and the release of the pressurized gas **49** through the blow off nozzle attachment in-between filling cycles. The controller **28** also can be used to time the duration of release of pressurized gas **301** into the nozzle attachment **10**. The sanitary or sterile gas that can be used includes, for example, inert gas, heated air, nitrogen, or steam, and so forth. It will be appreciated that the pressurized gas **300** does not necessarily have to be sanitary or sterile gas for all applications in which the nozzle attachment **10** can be used in conjunction with a dispensing head or filling valve, especially in many applications not involving foods. In one non-limiting embodiment, about a 0.5 to 1.0 second, more particularly about a 0.6 to 0.8 second, blast of air, at about 50 to 100 psig, more particularly about 70 to 80 psig, is emitted from the blow off nozzle attachment **10** to provide a blow off force at the discharge end **14** of the nozzle **15**. The blow off air can be performed as a rapid series of pulses or as a single blast for each residue elimination procedure.

After performing the blow off procedure using nozzle attachment **10**, a weight sensing means (not shown) can be used to measure the specific amount of fluid dispensed in the most recent dispensing and nozzle cleaning cycle, and that information can be transmitted to controller **28** via communication line **31**. The controller **28** can determine if the dispensed amount is within predefined tolerances, before initiating the next dispensing cycle.

The dispensers adapted with the nozzle attachment described herein can be conveniently and efficiently used to fill a plurality of containers in sequence, or otherwise dispense uniform amounts of fluid in sequence.

As will be appreciated, while the outer and inner nozzle attachment components **42** and **41**, respectively, are illustrated in this example as including cylindrical body portions, their body portions are not limited to that geometry. They are hollow body portions that can be virtually any geometric shape in cross-section, e.g., circular, square, octagonal, and so forth, as long as they are dimensioned with diameters meeting the requirements of this invention and providing an adequate central opening in the inner nozzle attachment component to permit the valve head to be extended through it in an unobstructed manner. For convenience sake, the inner and outer body portions generally will be used having the same type of geometry other than the respective radial dimensions thereof. Regular geometric shapes are preferred, and cylindrical shapes are more preferred, although not required.

Referring again to FIG. 8, in another embodiment, at least one anti-build port, illustrated as port **411**, is included in the inner nozzle attachment component **41**. Referring again to FIGS. 4 and 5, the gas introduced into passageway **43**, which is best seen in FIG. 4, will be diverted and flow through ports **411**, **412**, **413**, and **414** into a gap **408** that is present between the inner surface **409** of the inner nozzle attachment component **41** and the outer surface **161** of the discharge end **14** of nozzle **15**, which is best seen in FIG. 5. This is performed in a manner effective that a positive pressure also is created in the gap **408**, which will prevent or remove any creep up of tailings into that gap. In one preferred embodiment, multiple anti-build ports **411**, **412**, **413** and **414**, which may have radial locations as generally indicated in FIG. 5, are provided at substantially equidistant locations around the circumference of inner nozzle attachment component **41**. For example,

the four ports **411**, **412**, **413** and **414** can be spaced approximately 90 degrees apart from one another around the circumference of inner nozzle attachment component **41**. The port **411** alternatively could be a narrow slot that extends around at least a part of the circumference of the inner nozzle attachment component **41**. The air gaps created by the anti-build ports will be sized and located in a manner effective prevent or remove any creep up of tailings into the gap between the inner surface **409** of the inner nozzle attachment component **41** and the outer surface **161** of the discharge end **14** of nozzle **15**, but without causing a gas pressure loss in primary passageways **43** and **44** between inner and outer nozzle components **41** and **42** that would not undermine the herein-described drip-removal function associated with those features.

The nozzle attachment of the present invention has many advantages and benefits. The nozzle attachment can be readily detached from a filling valve nozzle. Herein, the term filling valve nozzle is used to be generic to the entire dispensing head such as illustrated in FIG. 1 or to only the nozzle portion of the filling head. It can be easily and fully dismantled to permit full inspection and cleaning, i.e., the nozzle attachment of the present invention will support manual cleaning operations. The inspection is done to check for visible contamination or wear, performing microbial swab tests, and so forth.

No tools are needed to assemble or dismantle (disassemble) the nozzle attachment part, as this can be done fully by hand in a "tool-less manner." All the internal surfaces and parts of the nozzle attachment can be inspected after disassembly of the component. The nozzle attachment also could be used in a clean-out-of-place mode where the part is dismantled substantially but not completely during inspection and cleaning procedures, depending on where the cleaning and sanitary concerns are the greatest with respect to the part. For example, it may not be necessary to fully dismantle the wing-nut tightening parts for cleaning procedures used in some in applications, such as some non-food processing applications.

The nozzle attachment has no grooves, hidden surfaces, or recesses in which food particles might be entrapped and harbored to create a potential contamination risk. The nozzle attachment also can be used in modified atmosphere packaging (MAP) applications in high micro environments in

connection with dispensing liquid or otherwise flowable product into packages to eliminate oxygen from head space and provide shelf stable products.

The nozzle attachment is particularly well-suited for food processing operations in which flowable food is being intermittently dispensed from a dispenser in uniform amounts. Examples of such foods that can be processed in a flowable state, include, for example, process cheese, dairy cream, mayonnaise, meats (e.g., beef, pork, poultry, or combinations thereof), liquid eggs, fruit-containing materials or beverages, peanut butter, and so forth. In one embodiment, the nozzle attachment addresses the weight control and dripping problem associated with prior fluid-form food dispensers by use of a timed sanitary air blow upon closure of a filling valve, around the entire shear surface area, to pulse the residual fluid into a primary filled package. Gas flow is balanced and aimed downward to disallow lateral blow off concerns.

The nozzle attachment of this invention is sanitary dairy, meat, or poultry 3-A compatible and meets the requirements of USDA 3-A sanitary applications. The nozzle attachment of this invention can be used on most standard sanitary filling valves, and it can be interchanged between filling valves of the same size. The nozzle attachment of this invention can used in food processing applications as a clean-out-of-place or manually cleanable part. It has no hidden passageways, which permits full inspection and cleaning. The nozzle attachment can be used in conjunction with the most rapid fill and low tolerance weight operations because it does not adversely affect the weight operation. The nozzle attachment can be used to remove residual material adhering to the end of the valve as well as provide gas flush capabilities for modified atmosphere packaging ("MAP") for all the benefits gained with reduced oxygen levels. In an alternative embodiment, the nozzle attachment also permits the gas blow system to be directly connected to a Clean-In-Place (CIP) system.

In one non-limiting example, a sanitary design of the nozzle attachment can be provided by use of stainless steel for all parts of the nozzle attachment. For example, 316L stainless steel can be used for all parts of the nozzle attachment. Alternatively, the various nozzle attachment parts also can be made of other suitable materials that can be shaped into the applicable configurations, such as plastic materials, ceramic materials, and so forth, and, if desired or necessary,

which can be maintained in a sanitary condition. The same or different types of such materials can be used for the various parts of a given nozzle attachment.

In addition, the wetted parts of the dispenser, including, for example, the valve stem, valve head, and valve body, also can be made out of 316 stainless steel. 304 stainless steel could be used for the yoke, actuator cylinder, and other non-wetted parts of the fluid dispenser, although the filling valve construction is not limited thereto. For example, the valve head, and so forth, alternatively could be a fluoropolymer construction, or a fluoropolymer-coated metal construction, or other material that is essentially inert and stable in the filling environment. The valve head also could include a fluoropolymeric or EPDM sealing ring, and the like, retained in an integral circumferential groove to provide the valve seat.

It will be understood that the teachings of the present invention are readily adaptable to many types of fluid dispensers that intermittently dispense liquids other than those specifically shown or identified herein. For example, the nozzle attachment could be used with nozzled dispensers used for other types of flowable viscous materials, such as molten polymeric compositions, plastic compositions, hot melt adhesives, and so forth.

While the invention has been particularly described with specific reference to particular process and product embodiments, it will be appreciated that various alterations, modifications and adaptions may be based on the present disclosure, and are intended to be within the spirit and scope of the present invention as defined by the following claims.